

G54DIA: Designing Intelligent Agents

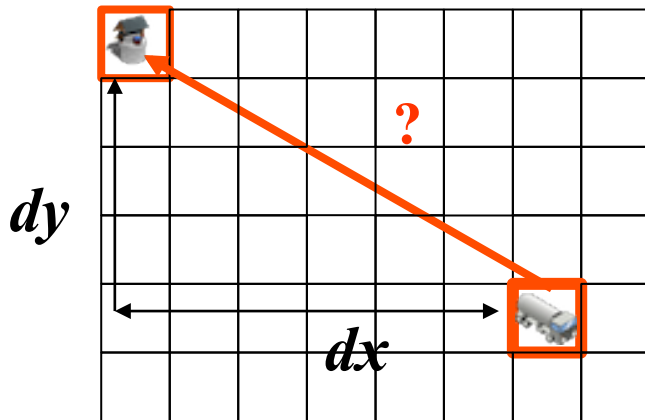
Tutorial 3: Exploiting Information
(based on slides by Julian Zappala)

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Outline of this tutorial

- computing distances
- results of exploration
- objectives of exploitation
- efficient exploitation
- choosing tours
- improving tours

Computing distances

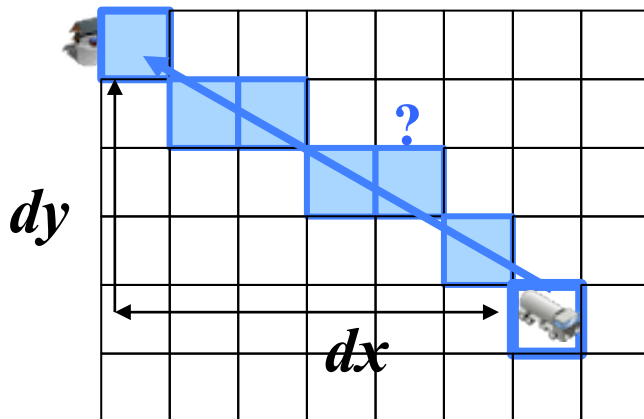


if we are thinking in “real” distance:

$$dx = 6, dy = 4$$

$$? = \sqrt{dx^2 + dy^2}$$

however, the agent can move one cell in any direction



So, instead we have

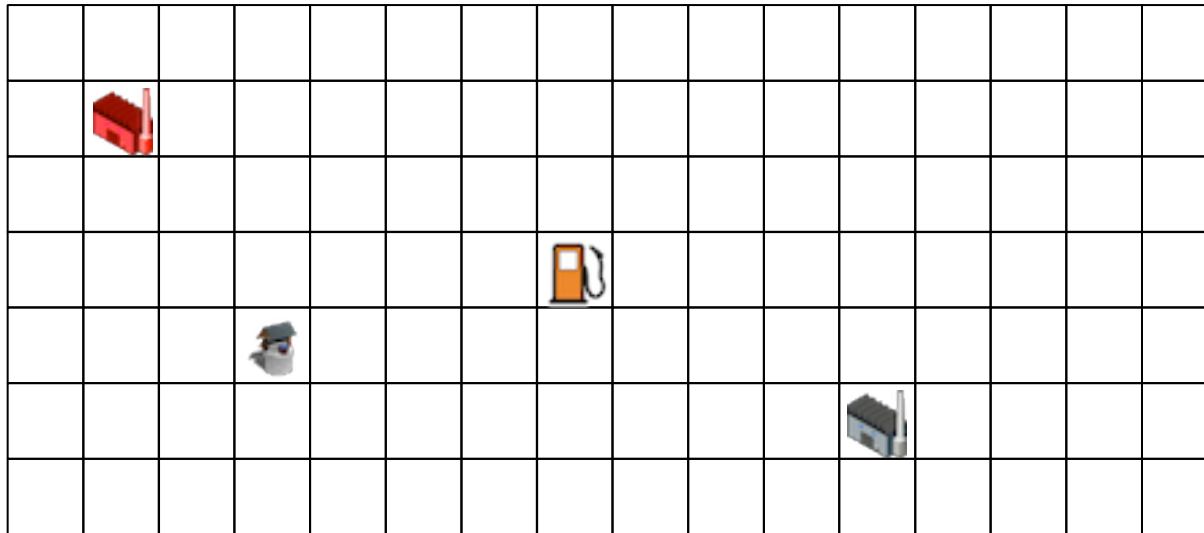
$$dx = 6, dy = 4$$

$$? = \max(dx, dy)$$

Results of exploration

- after exploration agents know:
 - locations of one or more wells and stations
 - details of one or more tasks (possibly out of date?)
- this information can be used to construct a map of the agent's surroundings and a list of things to do
- need for such representations depends on the architecture

Map & task list



Quantity	Location
7500	-6,3
...	...
...	...
...	...
...	...
...	...

- let's assume that the agent has constructed a map and list of tasks
- what should the agent do next?

Objectives of exploitation

- the objective of exploitation is to use this information to help the agent to achieve goals
- e.g., deliver as much water as possible complete as many tasks as possible in the time remaining
- efficient exploitation seeks to maximise (or minimise) some objective function
- e.g. maximise the score or minimise the amount of fuel (time) expended (or both)

Efficient exploitation 1

- which task to do next
 - arbitrary choice (first one, random choice, etc,...)?
 - evaluate alternatives (closest, largest amount of water, etc?)
- how to collect water for a task
 - opportunistically, or when required?
 - which makes best use of time/fuel?

Efficient exploitation 2

- when a new task is discovered
 - should the agent do it now
 - add it to the list of tasks?
 - re-evaluate which task to do next?
- ... while not running out of fuel (see last week)

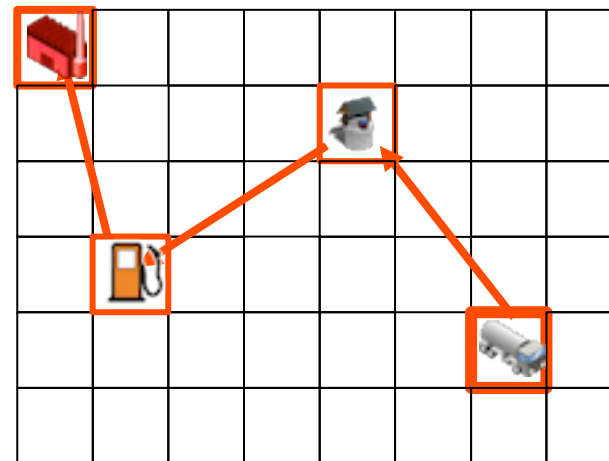
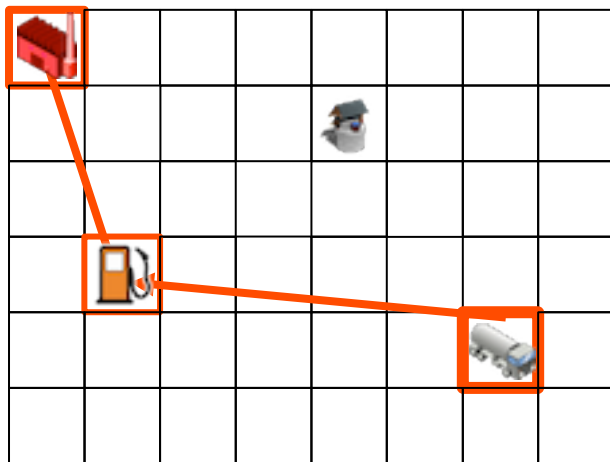
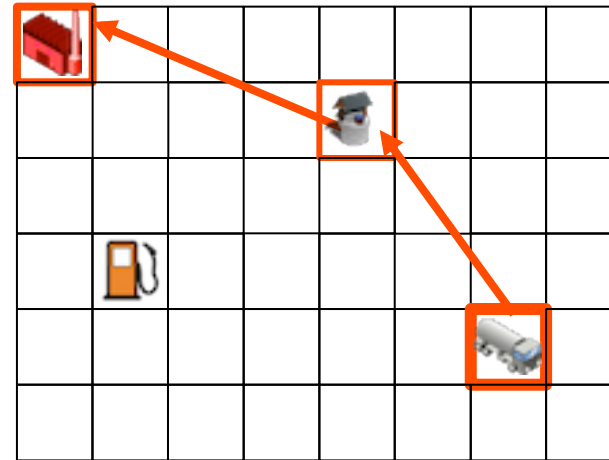
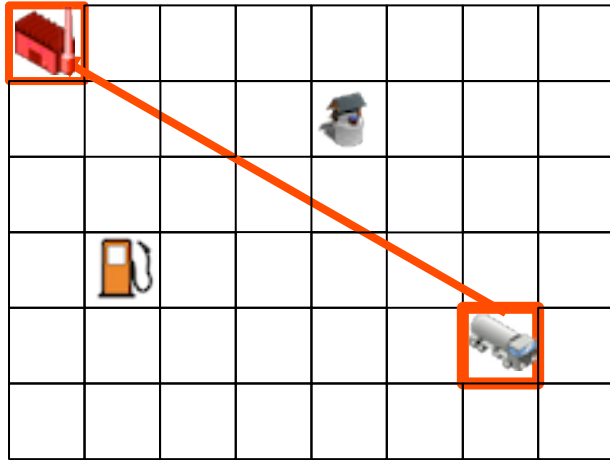
Choosing tasks

- which task is “best”?
- score is obviously an important criterion, but which other criteria are important?

Choosing tours

- we can think of a trip which completes one or more tasks as a *tour*
- we can then reformulate the problem as which tour is “best”?
 - where should the tour begin/end?
 - in which order should the agent visit stations/wells/fuel pump?
 - how long should the tour be?

Example single task tours



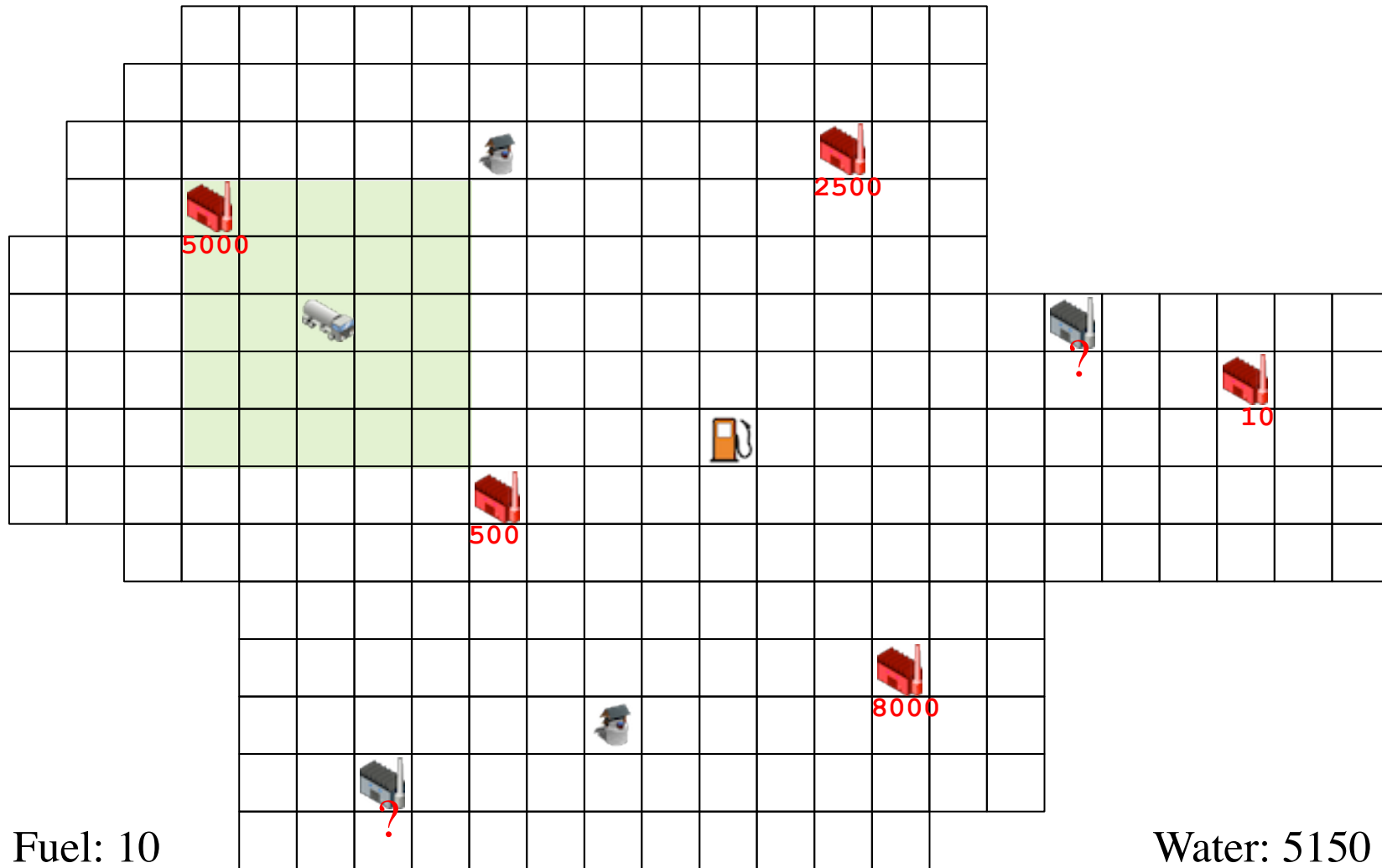
Improving a tour

- one way to plan is to start with a single-task tour and ask: “can this be improved?”
- what do we mean by “improved”?
- one possible definition: *a tour can be improved if the agent can get a better outcome for a little extra effort*
 - what do we mean by “better outcome”?
 - what do we mean by “effort”?
 - how much is “a little”?
- can we quantify the improvement?

New options

- while moving about, an agent may encounter one more new:
 - wells
 - stations
 - tasks
- what are the implications of each for:
 - a reactive agent?
 - a deliberative agent?

Discussion: what should happen next?



Fuel: 10

Water: 5150

The next tutorial

Report writing